The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

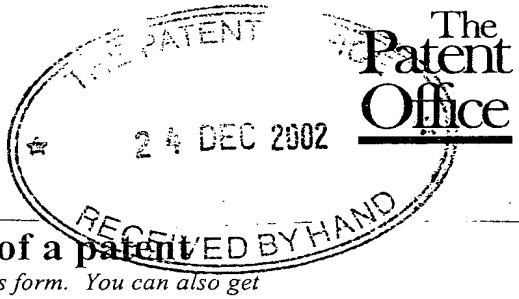
Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 29 May 2003

Patents Form 1/77

Patents Act 1977
(Rule 16)



The Patent Office

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

24 DEC 2002

1. Your reference

302458GB/DJW/ac

2. Patent application number
(The Patent Office will fill in this part)

0230197.6

26DEC02 E773761-14 002825
P01/7700 0.00-0230197.6

3. Full name, address and postcode of the or of each applicant (underline all surnames)

AVAYA UK
AVAYA HOUSE
CATHEDRAL HILL
GUILDFORD
SURREY
GU2 7YL

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

UNITED KINGDOM

08534216001

4. Title of the invention

MESSAGING SYSTEM

5. Name of your agent *(if you have one)*
"Address for service" in the United Kingdom to which all correspondence should be sent
(including the postcode)

PAGE WHITE & FARRER
54 DOUGHTY STREET
LONDON
WC1N 2LS
UNITED KINGDOM

Patents ADP number *(if you know it)*

1255003

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body
See note (d))

YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

	Continuation sheets of this form
Description	**10**
Claim(s)	**1**
Abstract	**0**
Drawing(s)	**4** + 4 fm

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents *(please specify)*

11. I/We request the grant of a patent on the basis of this application.

Signature
PAGE WHITE & FARRER

Date
24 December 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

David J Williams 020 7831 7929

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form. please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.

e) Once you have filled in the form you must remember to sign and date it.

f) For details of the fee and ways to pay please contact the Patent Office.

MESSAGING SYSTEM

The present invention relates to the field of messaging systems, and particularly but not exclusively to voice messaging and unified messaging systems.

Messaging systems are well-known in the art. One of the simplest form of messaging system is a voice messaging system. Computer telephony integration (CTI) is a term which refers to the integration of computer architectures with telephony systems. A voice messaging system is an example of a CTI system, and a further example is a unified messaging system.

Voice or unified messaging systems have conventionally been deployed in one of three implementations.

In a first voice messaging implementation a voice messaging (or unified messaging) system is co-located with a subscriber's telephone switch, i.e. a subscriber's private branch exchange (PBX). Within a multi-site organization or enterprise this will tend to result in each physical location (which has its own telephone switch) having a separate voice messaging (or unified messaging) system. For an enterprise with many distributed locations, such an arrangement requires the deployment of many (possibly small) systems resulting in considerable IT administrative costs.

Figure 1 shows two distributed locations each with their own telephone switch, specifically a PBX, and dedicated unified or voice messaging system. This system provides, at least, the following three typical voice messaging functions: call answering, automated attendant and subscriber access.

1. The call answering feature is initiated when calls are forwarded by the telephone system as a result of the called party not answering (e.g. due to a busy or no-answer condition).

2. The automated attendant feature offers callers a menu for automatically routing a call to the desired answering point, without the need for operator intervention.

3. The subscriber access feature allows subscribers, or mailbox owners, of the voice messaging system to call into the system and retrieve their messages over the phone.

In a second voice messaging implementation, the voice messaging system utilizes a deployment of a central messaging system serving multiple remote locations. This

form of deployment requires long-distance telephone connections to be provided between the remote private branch exchanges (PBXs), serving remote locations, and the centralized messaging system.

Figure 2 shows two locations being served by a single centralized unified or voice messaging system. The long distance telephone connections generally need to be provided regardless of their use (i.e. it is necessary to purchase enough capacity to handle busy periods). In addition some voice messaging features are lost in the centralized arrangement of Figure 2. The automated attendant application provides callers into an office or building with the ability to connect to a user. This capability is not provided in the centralized arrangement of Figure 2: the system providing the automated attendant function handles all users for all systems, and so does not provide service equivalent to a human attendant at the remote site. Additionally, different offices may be located in different countries with different language requirements. A simple example is that a first office may be in Canada and need both English and French languages, whereas another office served from the same centralized facility may have entirely, non-overlapping, language requirements, for example locating in Japan.

In a third implementation the second implementation is modified such that the long-distance telephone connectivity is provided by an organisation's (existing) data (IP) Wide Area network (WAN), possibly using Voice over Internet Protocol (VoIP). This deployment puts a strict requirement on the bandwidth and more critically the quality of service (e.g. the network latency) characteristics of the corporation's WAN. This, most generally, is not, and will not be met for the majority of corporations now or in the near future.

It is an aim of the present invention to provide an improved messaging system.

The present invention relates to a messaging system comprising a plurality of remote servers and a centralized data store associated with a said plurality of remote servers, in which system the centralized data store includes means for storing messages and data associated with all users of the plurality of remote servers, and the plurality of remote servers are each associated with a respective cache means for storing at least a portion of the data associated with users of said

remote server such that at least one voice messaging function can be provided to users of said voice server independent of the centralized message store.

The at least one voice messaging function may include call answering.

The plurality of voice servers may be associated with a plurality of voice mail domains. The number of voice servers may correspond to the number of voice mail domains. Each voice server may be associated with a telecommunications switch. The telecommunications switch may be a public branch exchange.

The centralized data store may further be provided with a voice mail domain interface, said interface being connected to a dedicated telecommunications switch, such a private branch exchange. Such switch may provide subscriber access to the centralized data store.

The centralized data store may provide a common message store for al l voice mail domains and a common directory store for all voice mail domains.

There may be provided for subscriber access to the centralized data store via said interface.

In accordance with embodiments of the invention the messaging function is architecturally split into a number of separate components which, critically, can be implemented in at least two separate computer systems. These systems can be deployed:

i. In separate physical locations connected using a data network. The message storage can be centralized within a single (or few) data storage facilities, providing security, simplicity and management costs benefits.

ii. These systems provide the beneficial external user characteristics normally derived from multiple distributed systems (e.g. a local automated attendant is provided, specific language support etc).

iii. In addition these systems may be engineered to provide reliable voice/unified messaging support without strict requirements on data network availability and quality of service (QoS).

Such an architecture allows much more flexibility of deployment for voice messaging or unified messaging systems.

There are considerable cost savings to be realized within enterprises by centralizing the storage of corporate data. Messages within e-mail or voice-mail systems derive similar benefits from a centralized storage policy. A geographically distributed Unified or Voice Messaging architecture provides a mechanism to deploy part of the Unified or Voice messaging function co-located with a subscribers telephone switch while also allowing for a centralized message storage facility.

The invention is now described by way of example with reference to the accompanying figures, in which:

Figure 1 illustrates an example of a voice or unified massaging system at which telephone switches and messaging systems are deployed at multiple locations, as known in the art;

Figure 2 illustrates an example of a voice or unified messaging system at which telephone switches and messaging systems are deployed at multiple locations together with a central messaging system, as known in the art:

Figure 3 illustrates an example of a voice or unified messaging system at which telephone switches and messaging systems are deployed at multiple locations together with an enhanced central messaging system in accordance with an embodiment of the present invention;

Figure 4 illustrates an example implementation of the enhanced central messaging system of the embodiment of Figure 3: and

Figure 5 illustrates an example implementation of a messaging system deployed at a location in accordance with the embodiment of Figure 3.

The present invention is described herein by way of reference to a particular example, and in particular to the example of a unified/voice messaging system. However the invention is not limited in its applicability to the examples and embodiments described herein.

Referring to Figure 3 there is shown a unified/voice messaging systems deployed in a geographically distributed manner and implemented in accordance with a preferred embodiment of the present invention.

The PBX's of the remote or distributed locations are provided with front-end voice/unified messaging functionality, and connected via a data network to a centralized voice/unified messaging system back-end. The front-end voice/unified messaging functionality provides certain voice/unified messaging functions at the respective PBX independent of the centralized voice/unified messaging system back-end. The back-end provides voice/unified messaging functionality and provides certain voice/unified messaging functions for all PBXs.

It should be noted that although the embodiment specifically discloses the provision of PBXs at remote locations, more generally the remote locations can be considered to be provided with a switching capability, or telecommunications switch. Furthermore, although reference is made in this description to the provision of front-end functionality or systems and back-end functionality or systems, more generally these can be considered to remote and central functionality or systems.

The front-end or remote system functionality may include, for example, call answering and automated attendant functionality. These front-end or remote systems may also provide subscriber access capability. However the implementation of subscriber access may depend on the data networking characteristics, i.e. quality of service (QoS) of the connection from the front-end to the back-end.

The implementation of the centralised data facility or voice/unified messaging system back-end system or central system of Figure 3 in accordance with an example embodiment of the invention is shown in Figure 4.

Referring to Figure 4, there is shown four unified messaging voice servers and a. Each of the servers of the respective voice mail domains is connected to a network interface which is in turn connected to the data network of Figure 4. Each of the four voice servers is associated with a PBX at a remote location. PBX's at different remote locations may be associated with the same voice mail domain, or with different voice mail domains. Thus the number of voice mail domains is determined by the number of remote sites associated with a voice mail domain. The four servers of Figure 4 are associated with all voice mail domains.

A single PBX may be associated with a single one of the servers of Figure 4, or multiple servers, due to system size, and hence any one of the servers of voice mail of Figure 4 may, for example, be associated with one or all of the connected PBXs.

In an example where there is provided eight remote sites, the PBX of each site is associated with all four-voice servers of Figure 4. If Each of the eight PBXs has its own voice mail domain, then the four PBXs of Figure 4 support four voice mail domains.

As shown in Figure 4, the voice servers are associated with a message store and a directory. The message store stores messages, such as voice mails and e-mails, associated with system users. The directory stores descriptive attributes associated with those system users, and system configuration data. The message store and the directory are shared for all voice mail domains.

As shown in Figure 4, there is provided a central group of voice servers in the central system, corresponding to the clustered front-end of Figure 3 providing service on behalf of multiple voice mail domains. As will be discussed further hereinbelow, the cluster interface provides an interface between the PBX connected to the toll-free lines and the centralized message store associated with the servers of the back-end system or central system. This provides for the function of subscriber access.

The implementation of the distributed voice/unified messaging system front-end or remote system of Figure 3 in accordance with an example embodiment of the invention is shown in Figure 5.

Each PBX is associated with a remote voice server, which may also be considered to be a front-end voice server. As can be seen, the remote voice server is connected to a network interface which provides connections to the data network. The remote voice server contains a cache memory store and a cache directory, illustrated in Figure 5 as connected to the server. In accordance with a preferred example of the present invention, and as discussed further hereinbelow, information associated with the users connected to the PBX, and stored in the corresponding message store and directory of Figure 4, are copied to the caches of Figure 5, such that a local copy of such information is available.

The invention provides in a first embodiment, mechanisms to allow call answering and automated attendant functionality to operate when supported by low-guarantee network connectivity from the messaging system back-end. This is achieved by providing the necessary functionality at the front end. As such the provision of the functionality is not dependent upon any permanently available back-end or central connectivity. This is achieved by providing the necessary data, logic and control

parameters to achieve such functionality in the caches. The back-end or central systems provide the primary message storage and directory storage and configuration data. All data, messages, user properties and system configuration information is primarily stored at the back-end or central system.

The invention provides in a second embodiment a mechanism for reliable subscriber access through direct connectivity to a large 'clustered' front-end capability co-located with the back-end systems, in the centralized data storage facility, as provided for in Figure 4.

In the following description, the invention is considered in two parts, although it should be understood that much of the functionality is shared. The invention is also described by way of reference to examples of specific feature implementations, but is not limited to such.

In a first embodiment, there is described in accordance with a preferred implementation of the invention the implementation of a call answering function and an automated attendant function supported remotely from the distributed centralized data facility, via a low QOS data network, as illustrated in Figures 4 and 5. This relates, more generally, to a description of those functions which can be provided independent of access to the back-end.

Call answering is a relatively simple process with only limited requirement for access to user and system data. The call answering process requires access to data of the following classes:

I. System properties, including system configuration data such as language availability; and

II. User properties, such as user configuration data such as 'find-me' rules and user status (e.g. extended absence), as well as associated audio greetings.

The front-end systems associated with each PBX need to maintain a cached copy of this data to allow a high degree of quality and reliability in the call answering process regardless of the connectivity to the back-end.

Preferably a cache management process operates in the background (at a pre-defined time interval, e.g. 5 minutes) and creates a local (and persisted) cache of both system and user properties from the back-end primary stores. As shown in Figure 4, the directory includes voice mail domain (VMD) objects and subscriber

objects. For VMD objects the system configuration parameters for each voice mail domain are defined. For subscriber objects the VMD identity for each subscriber is defined. This information is cached at the remote system. The cache management is preferably provided by the front-end or remote system. A time-stamp is preferably stored for user greetings in the message store. Before an audio greeting is played, the front-end system checks the time of last-update on the back-end cached version of the greeting. If the front-end cached version of a greeting is correct, then it is used. Otherwise a copy may be fetched from the back-end. In general, call answering results in recording an audio message. This can be submitted for delivery in the background with little real-time network capability.

Automated attendant, when supported by a cache of user and system properties as shown in Figure 5, can also work in the local front-end system.

It is also possible to 'dynamically cache' information to reduce the effects of network latency and 'smooth-off' bursts of high network bandwidth requirements. As an example, the n+1th message can be pre-fetched when the nth message is played. This serves, to a point, to provide improved operation on poor networks but cannot cover all real-world network (e.g. total WAN failure) conditions.

In a second embodiment, there is described in accordance with a preferred implementation of the invention the implementation of a subscriber access function supported at a shared centralized front-end system, as illustrated in Figure 4, whilst exhibiting the same user characteristics as if calling a local system in the arrangement of Figure 1.

Existing voice mail systems contain considerable system configuration data which defines the operation of the system. This information, in the Avaya unified messenger and MMA systems, is stored within a directory object called a voice mail domain object, in the directory of Figure 4. In the preferred embodiments of the present invention, the front-end systems maintain a cache of this information, while the back-end systems manage the primary copy of the configuration data. In existing systems, and as mentioned hereinabove, multiple front-end systems can be part of a single voice mail domain.

However critically, in order to provide subscriber access, the front-end systems co-located with the centralized data stores need to be able to be part of multiple voice mail domains. A call coming into the clustered front-end may be associated with

any VMD, and there is therefore a need to direct it to any VMD. The single (large) centralized system of Figure 4 must be able to operate as part of all voice mail domains for which subscriber mailboxes are hosted. All voice mail domains are defined by directory objects stored in the directory systems within the back-end systems and as a consequence this configuration data is available to both local and centralized front-end systems. This access to the configuration data of all voice mail domains is provided by the cluster interface of Figure 5.

Subscribers calling into the large centralized front-end system via the toll-free PBX must be identified. This identification can be based, for example, on one of two preferred options:

a) Identification of the called number. This works if the subscribers of each voice mail domain are given a different number to call (possibly an 800 number). In such case their locally-valid mailbox number is enough to identify the subscribers.

b) By logging into the system using an enterprise/organization wide numeric address, and not their usual mailbox/extension number (which is only valid in conjunction with their voice mail domain). This address allows the user to be identified, from which a VMD can be identified.

The clustered or centralised voice servers of Figure 4can be adapted to provide identification of the called number to interpret the call for the appropriate voice mail domain. The centralized voice servers may therefore include a look-up table matching dialed numbers to voice mail domains.

Once the voice mail domain (VMD) and the subscriber are identified the centralised front-end system of Figure 4 needs to provide an interaction which is identical to that experienced by a subscriber calling into a local front-end system of Figure 1. The front-end system shifts it's *modus operandii* based on the voice mail domain information, i.e. the system operates as if it were the voice mail domain identified. All system parameter information is available and used to provide the required interface.

Once logged on, subscribers are presented with the correct addressing options. Addressing a message to a user by their mailbox/extension number must work correctly. A user within location 1 (e.g. voice mail domain A) addressing a message to "4003", needs to have this resolved to the 4003 mailbox (at location 1). A user from location 2 (e.g. voice mail domain B) may address to the same number and

must have this resolved to a different mailbox. The provision of the clustered front-end of Figure 4 provides for such features to work correctly.

Certain voice/unified messaging scenarios result in the system launching outbound calls. To allow centralized systems to perform this correctly, telephone numbers must be stored in their canonical form. Both types of front-end systems (distributed and centralized) are preferably configured with rules to ensure calls are correctly dialed.

The present invention is described herein with reference to particular examples. The invention is not limited in its applicability to the examples given. One skilled in the art will appreciate the general applicability of the present invention.

Claims

1. A messaging system substantially as described herein.
2. A messaging system substantially as described herein with reference to, or as shown in, any one of Figures 3 to 5.
3. A method of operating messaging system substantially as described herein.
4. A method of operating a messaging system substantially as described herein with reference to, or as shown, in any one of Figures 3 to 5.

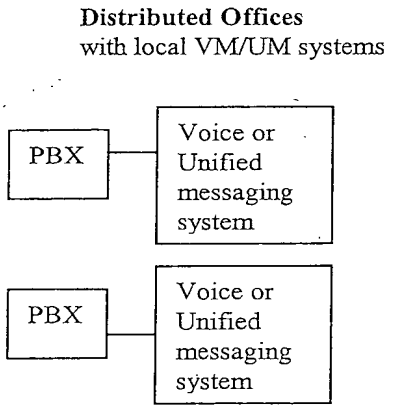


Figure 1

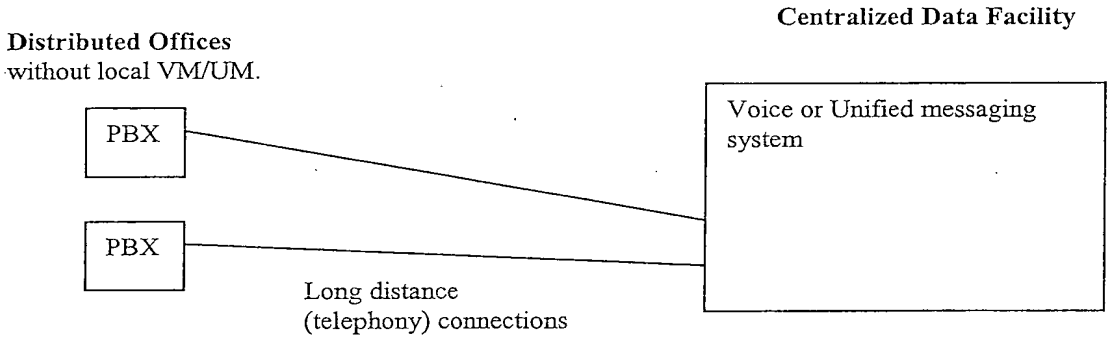


Figure 2

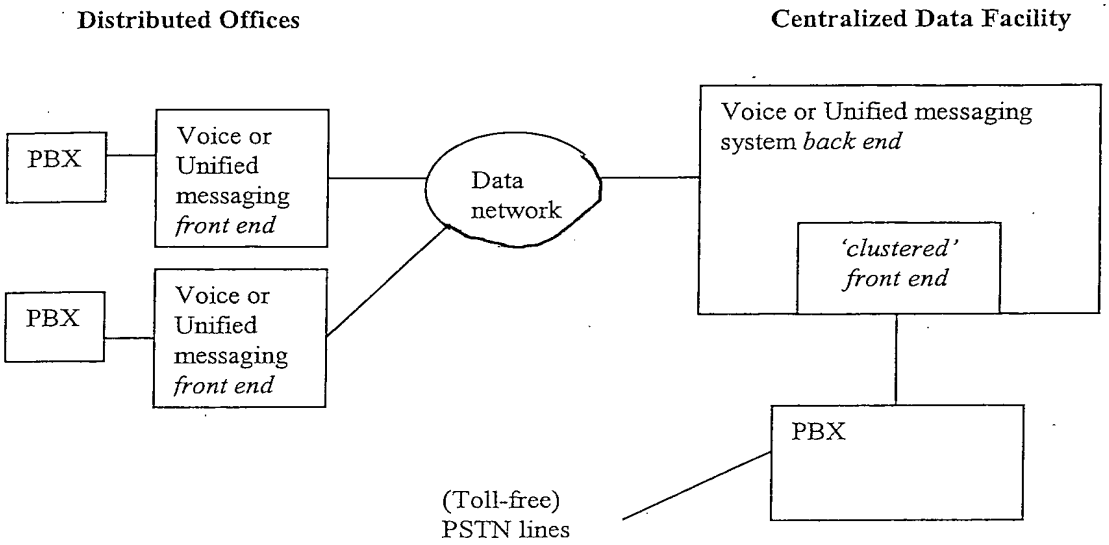

Distributed Offices
Centralized Data Facility
PBX
Voice or Unified messaging front end
PBX
Voice or Unified messaging front end
Data network
Voice or Unified messaging system back end
'clustered' front end
PBX
(Toll-free) PSTN lines

Figure 3

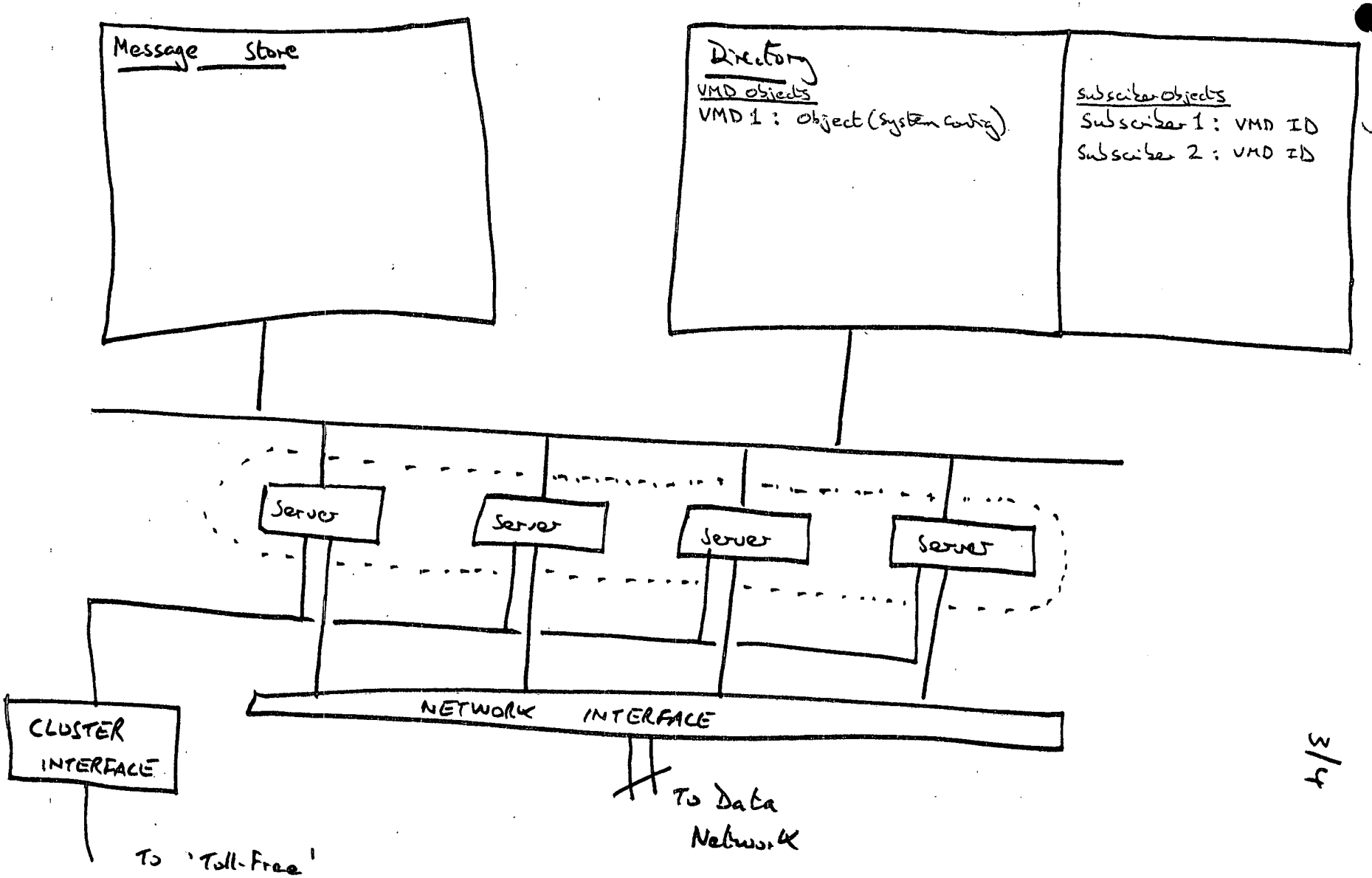

Message Store
Directory
VMD objects
VMD 1 : object (system config)
subscriber objects
Subscriber 1 : VMD ID
Subscriber 2 : VMD ID
Server
Server
Server
Server
NETWORK INTERFACE
CLUSTER INTERFACE
To 'Toll-Free' PBX
To Data Network

FIG 4

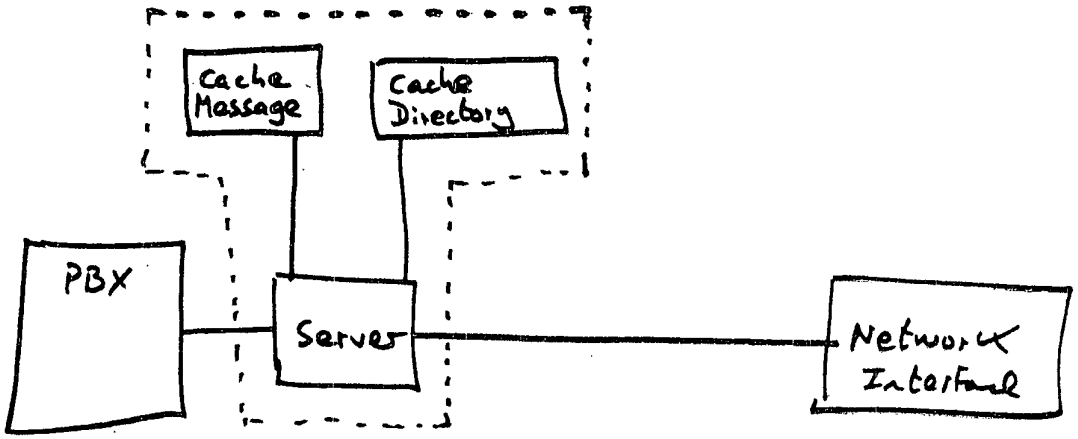

Cache Message
Cache Directory
PBX
Server
Network Interface

FIG 5